In spite of this disagreement as to conclusions, however, GATES's investigation is to be welcomed as being carefully made and as adding to our knowledge of the moisture relations of various plant communities.—GEO. D. FULLER.

Germination.—LESAGE[24] has made a rather extensive study of the effect of various conditions and reagents upon the germination of seeds of *Lepidium sativum*. He finds a selectively permeable membrane surrounding the seed, as has been found for many other seeds. This is shown by the fact that the yellow pigment of the seeds diffuses out when the integrity of the membrane is destroyed by mutilation of the seeds or by treating them with dilute potassium hydrate solutions. The exosmose of the pigments occurs in hydrate solutions considerably more dilute ($\frac{1}{64}$ mol.) than those completely inhibiting germination ($\frac{5}{64}$ mol.). The data on the life duration of seeds, soaked in various concentrations of ethyl alcohol and aqueous solutions of salts followed by thorough washing in distilled water, are of great interest. Absolute alcohol did not injure these seeds after 4 years and 7 months soaking, and the life durations in various percentages are as follows:

94 per cent	2–3 months	33 per cent	2 hours
85 " "	50–90 hours	8 " "	4 days
75 " "	20 hours	5 " "	16 days
65 " "	6–7 hours		

If these data are plotted into a curve with the duration on the ordinates and the concentrations on the abscissae, the upward face of the curve is concave. A similar relation between toxicity and concentration holds for several salts that were studied. For NaCl and KCl solutions the highest toxicity (shortest life duration in the solution) was in 1–2 mol., and for NH_4Cl in 2–3 mol., higher concentrations proving less and less toxic as the concentration increased. For $NaNO_3$ the greatest toxicity lay between 2 and 4 mol., while for NH_4NO_3 it was between 1.25 and 6 mol. At the point of saturation, about 2 mol., KNO_3 had not reached its maximum toxicity. The seeds were not killed by 20 days' soaking in any concentration of Na_2SO_4, while $(NH_4)_2 SO_4$ showed its maximum toxicity at 2 mol.

The seeds still germinated after 4 years and 8 months soaking in petrol ether, but were quickly killed when soaked in ethyl ether. They germinated fairly well in moist air if it was saturated, but not at 98 per cent saturation. Temperature was an important factor here, 21° C. being the optimum. There is evidently a rest period in these seeds, for seeds one month old would not germinate in saturated atmosphere after 25 days, while 1-, 2-, 3-, 4-, and 5-year old seeds began to germinate after 3 days. Seeds that did not germinate after 5 months in saturated air still retained their vitality.

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[24] LESAGE, PIERRE, Au voisinage des limites de la germination dans les graines de *Lepidium sativum*. Rev. Gen. Bot. **29**:97–112, 137–157, 181–192. 1917.

Proper concentration of hydrogen peroxide proved to be a good forcing agent for such of these seeds as would not germinate readily, due to age or other causes. A 50 per cent aqueous solution of 8 vol. H_2O_2 completely inhibited germination, but 25 per cent and weaker solutions did not, but acted as forcing agents. While hydrogen peroxide hastened germination, it retarded the growth of the seedling.—WM. CROCKER.

Age and area hypothesis.—WILLIS[25] has recently advanced additional evidence to support his "age and area" hypothesis. Following his usual statistical method, he shows that the most widespread plants in New Zealand are those which reach outlying islands of the archipelago also. "There is no conceivable reason why ranging also to a few little islands should make a species more widespread in New Zealand, unless it be age, which has given them time to spread in New Zealand to the maximum degree."

In an accompanying paper the same author[26] strengthens his hypothesis by four additional pieces of evidence, arising from statistics on the following situations: the range of the orchids of Jamaica; the flora of Hawaii; the distribution of *Callitris* (Coniferae); the distribution of the ferns of New Zealand and Hawaii. "The endemic species (of ferns) show a much greater range than the endemic angiosperms, a result to be expected on my hypothesis, but contrary to what one would expect if endemics are dying out." In conclusion, the author points out that more care must be taken to consider geographical as well as structural relationship in forming genera and families.

It occurs to the reviewer to suggest that, in collecting data to support or discredit the age and area hypothesis, care should be taken that the plants considered are ecologically equivalent. The age and area hypothesis is founded on rate of distribution, and the latter certainly must vary as plants vary in their ecological status. In some of his more recent researches WILLIS has limited his consideration to plants of a given family. This should be more accurate than to consider any flora as a whole, for the plants within a given family are usually equivalent in their ecological status. This last, however, is not always true, so that the significance of some of the data given by WILLIS on distribution might sometimes be questioned. For example, it may be quite proper to say that widespread fern species are older than fern species of narrower distribution, but to state that because ferns are more widespread than angiosperms, the former are therefore older, is very questionable. Even if ferns were younger than angiosperms, the ease of spore dispersal might well render them more widespread than the latter.—MERLE C. COULTER.

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[25] WILLIS, J. C., The distribution of the plants of the outlying islands of New Zealand. Ann. Botany **31**:327–333. *fig. 1*. 1917.

[26] ———, Further evidence for age and area; its applicability to the ferns, etc. Ann. Botany **31**:335–349. 1917.